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(54) Title: **PLURAL SIGNALING CHANNELS FOR COMMUNICATING SIGNALING INFORMATION TO A USER EQUIPMENT TERMINAL IN A RADIO COMMUNICATIONS SYSTEM**

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(57) Abstract: Two different types of signaling channels are used to communicate signaling information to a user equipment terminal in a radio communications system. A first type of signaling channel is dedicated for each of multiple user equipment terminals to transmit minimal notification information. A shared signaling channel is established between a radio access network and the multiple user equipment terminals to transmit substantive signaling information relevant to a data channel. Each of the multiple user equipment terminals is notified via its dedicated signaling channel when information on the shared signaling channel is relevant to that user equipment terminal. For example, the dedicated signaling channel may provide a power on/off type of notification to the user equipment. When an "on" signal is detected, the user equipment terminal receives and detects the information on the shared signaling channel, and using that information, receives and detects data packets on the data channel. Otherwise, the user equipment terminal does not waste resources monitoring or receiving information on the shared signaling channel. Alternatively, a single bit flag may be sent to provide a positive or negative notification. The signaling information may include any type of control information. In a non-limiting example, embodiment, the signaling information includes one or more parameters relating to transmission of data over the data traffic channel such as a modulation scheme, a coding scheme, data packet sequence numbering information, spreading code information, timing information, etc.

PLURAL SIGNALING CHANNELS FOR COMMUNICATING SIGNALING  
INFORMATION TO A USER EQUIPMENT TERMINAL IN A RADIO  
COMMUNICATIONS SYSTEM

FIELD OF THE INVENTION

5           The present invention relates to radio communications, and more particularly, to communicating control signaling information between a radio access network and user equipment terminals.

BACKGROUND AND SUMMARY OF THE INVENTION

10           In radio communications systems, such as cellular systems, the radio bandwidth is typically divided among traffic channels and control channels. Control information communicated between a radio access network and user equipment terminals, e.g., mobile telephones, mobile data terminals, wireless telephones, wireless data terminals, etc., is typically needed to carry out several important functions. Examples of such functions include: locating mobile user terminals, notifying user equipment terminals of  
15 calls from the radio access network, broadcasting various system parameters like timing/synchronization information, system identification information, channel identification information, etc. Despite the importance and necessity of control information, it is still desirable to minimize the amount of radio bandwidth and other resources, such as data processing and power resources, which are allocated to or reserved  
20 for control information so that bandwidth, data processing, power, and other resources can be devoted to traffic handling in order to maximize capacity.

          In a cellular system, an example of which is a wideband code division multiple access (WCDMA), one way of making more efficient use of resources is to have multiple user equipment terminals share radio channel resources. For example, a  
25 Downlink Shared Channel (DSCH) may be used for downlink data packet transmission. A downlink shared channel is a spreading code resource shared by several user equipment

terminals primarily through the use of time multiplexing. Time multiplexing means that the downlink shared channel is allocated to a specific user equipment terminal during a certain time interval. In addition, code multiplexing may also be employed as a way to share a downlink code resource by transmitting to several user equipment terminals  
5 simultaneously using different subsets of the spreading codes allocated to the downlink shared channel.

In future WCDMA systems, the modulation and coding schemes use for transmission on a downlink shared channel may be varied. The modulation and coding to be used for downlink transmission of data to a specific user equipment terminal is based,  
10 for example, on the current quality of the downlink radio channel corresponding to the user equipment. This type of scheme where the modulation and/or coding of a downlink transmission is referred to as "fast link adaptation."

In addition to the actual data transmitted on the downlink shared channel to user equipment terminals, the radio access network must also provide user equipment  
15 terminals that share the shared channel with signaling information related to the shared channel data transmission. Such information may include information identifying the specific user equipment terminal to which data is transmitted on the downlink shared channel during a particular time interval, information on a particular subset of shared spreading codes used for transmission to a specific user equipment during a corresponding  
20 time interval (if the shared channel uses code multiplex), information regarding a particular coding and modulation scheme being used on the shared channel for transmission to a specific code equipment terminal during a corresponding time interval, and sequence numbering for data packets transmitted to the specific user equipment on the shared channel during a corresponding time interval. The term "signaling information" as used  
25 herein may include any type of control information communicated between the radio access network and a user equipment other than the actual data sometimes called the payload.

Each user equipment terminal to which data may be transmitted over the downlink shared data channel may also be allocated downlink a dedicated physical channel which provides signaling information to the user equipment terminal relevant for the detection and decoding of the data on the downlink shared data channel. Fig. 1 illustrates this approach where each of the user equipment terminals  $UE_1 - UE_4$  a dedicated downlink signaling channel, and all user equipment terminals may use a single downlink shared data channel, where sharing may be accomplished using time multiplexing and/or code multiplexing. As illustrated in Fig. 2, each user equipment's downlink dedicated signaling channel includes general signaling information to support the detection and decoding of data on the downlink shared channel. When the relevant signaling information is acquired and decoded, the user equipment terminal may use this information for the detecting and decoding of the data on the downlink shared data channel. The signaling information transmitted on each of the downlink, dedicated signaling channels typically relates to the downlink shared data channel transmission at a somewhat later time interval  $\tau$  as shown in Fig. 2.

A disadvantage of the approach shown in Figs. 1 and 2 is that radio bandwidth or capacity must be allocated to each of the downlink dedicated signaling channels for the entire amount of signaling information (e.g., all of the possibly relevant transmission parameters), even though most of the signaling information is only relevant for the user equipment terminal for which the data on the downlink shared data channel is actually intended and not for the other user equipment terminals. Most of the user equipment terminals for which there is no data currently being sent over the downlink shared data channel do not need to know the current signaling information, e.g., the current modulation on the downlink shared data channel. Thus, this approach wastes resources including radio bandwidth and data processing resources to prepare, transmit, and receive this information, and battery power resources for all user equipment terminals listening on their downlink dedicated signaling channel and processing received signaling information that is not particularly relevant to the user equipment terminal.

Even if the signaling information is not explicitly transmitted to all user equipment terminals, sufficient signaling capacity (in terms of bits per time interval) still must be reserved on all of the downlink dedicated signaling channels. Each user equipment terminal must be informed if the data on the downlink shared data channel in a particular time interval is for that user equipment terminal or for some other user equipment terminal. One or more bits are required to convey this notification information. The user equipment terminal(s) that is (are) to receive the data on the downlink shared data channel during the corresponding time slot must also know the transmission parameters for the downlink shared data channel during this time interval.

Signaling information specifying such transmission parameters requires multiple bits, but it is only needed to be received by the user equipment terminal(s) that is (are) actually to receive data packets on the shared data channel during this time interval. Accordingly, if both notification and the additional signaling information are sent on each downlink dedicated signaling channel to each user equipment, each downlink dedicated signaling channel must set aside the bandwidth to carry these multiple bits per time interval. In wideband CDMA, because there is a fixed number of chips per time slot, the number of actual bits that can be transmitted per time interval depends on the spreading factor employed. The more bits that have to be carried per time interval to accommodate all of the signaling information needed to be transmitted over a downlink dedicated signaling channel to a user equipment, the lower the spreading factor needed for the downlink dedicated signaling channel, i.e., fewer chips are used to spread each bit. A lower spreading factor needed for the downlink dedicated signaling channel means that fewer spreading codes are available on the downlink which reduces the overall downlink capacity of the cellular system.

It is an object of the invention to reduce the number of bits needed to be sent per time interval on the downlink dedicated signaling channels in order to increase the spreading factor, and ultimately, the downlink capacity of the radio communications system. It is also an object of the invention to convey signaling information to the user

equipment terminals both effectively and efficiently so that resources including bandwidth, data processing, and power can be conserved.

In addition to reducing the number of bits needed to be sent per time interval on the downlink dedicated signaling channels, another object of the present invention is to also reduce the average transmit power of the downlink dedicated signaling channel thereby reducing capacity usage.

The present invention meets these objectives using dedicated and shared downlink signaling channels. A downlink signaling channel is dedicated for each of multiple user equipment terminals to transmit notification information from the radio network to the terminals. A downlink shared signaling channel is established between the radio access network and the multiple user equipment terminals to transmit substantive signaling information relevant to a data channel. Each of the multiple user equipment terminals is notified via its dedicated signaling channel when information on the shared signaling channel is relevant to that user equipment terminal. For example, the dedicated signaling channel may provide an on/off type of notification to the user equipment. When an "on" signal is detected, the user equipment terminal receives and detects the information on the shared signaling channel, and using that information, receives and detects data packets on the data channel. Otherwise, the user equipment terminal does not waste resources monitoring or receiving the shared signaling channel. The signaling information on the shared channel may include any type of control information. In a non-limiting example, embodiment, the signaling information on the downlink shared channel includes one or more parameters relating to transmission of data on a data traffic channel including, for example, parameters relating to a modulation scheme, a coding scheme, data packet sequence numbering information, spreading code information, timing information, etc.

A radio network node such as a base station may be configured to establish dedicated signaling channels for each of multiple user equipment terminals, a shared signaling channel, and a shared data channel. When there is signaling information to be or

currently being transmitted on the shared signaling channel relevant to a specific user equipment terminal, the radio access network notifies that specific user equipment terminal using its corresponding dedicated signaling channel. Each of the multiple user equipment terminals is then configured to detect the status of a signaling indicator on its  
5 corresponding dedicated signaling channel. Only when the indicator is positive does the user equipment terminal need to expend the resources necessary first to detect and decode the information on the shared signaling channel and second to receive, detect, and decode data on the shared data channel using signaling information acquired from the shared signaling channel.

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### BRIEF DESCRIPTION OF THE DRAWINGS

The various features and advantages of the present invention may be more readily understood with reference to the following detailed description taken in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

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Fig. 1 illustrates a radio communications system having downlink dedicated signaling channels for each of multiple user equipment terminals and a shared downlink data channel;

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Fig. 2 is a diagram illustrating a timing relationship between transmission of signaling information to the user equipment terminals and transmission of packet data to which that signaling information relates;

Fig. 3 illustrates a diagram of a radio communications system in accordance with one example embodiment of the present invention employing dedicated signaling channels for each of multiple user equipment terminals, a shared signaling channel, and a shared data channel;

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Fig. 4 is a function block diagram illustrating a radio base station which may be used to implement an example embodiment of the present invention;

Fig. 5 is a function block diagram of a user equipment terminal that may be used to implement an example embodiment of the present invention;

Fig. 6 is a flowchart diagram illustrating procedures that may be implemented at a base station in accordance with an example embodiment of the present invention;

Fig. 7 is a flowchart diagram illustrating procedures that may be illustrated by a user equipment terminal in accordance with an example embodiment of the present invention;

Fig. 8 is a diagram illustrating a wideband CDMA system where an example embodiment of the present invention is illustrated; and

Figs. 9A-9C illustrate various example timing embodiments of the present invention.

### DETAILED DESCRIPTION OF THE DRAWINGS

In the following description, for purposes of explanation and not limitation, specific details are set forth, such as particular embodiments, protocols, data structures, and techniques, in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced in other embodiments that depart from these specific details. In other instances, detailed descriptions of well-known methods, systems, and devices are omitted so as not to obscure the description of the present invention with unnecessary detail. Moreover, individual function blocks are shown in some of the figures. Those skilled in the art will appreciate that the functions may be implemented using individual hardware circuits, using software functioning in conjunction with a suitably programmed digital microprocessor or general purpose computer, using an Application Specific Integrated Circuit (ASIC), and/or using one or more Digital signal Processors (DSPs).



Reference is made to Fig. 3 which illustrates a non-limiting, example embodiment of the present invention in the context of a radio communications system. For simplicity, only a single radio access point is shown, although the radio access network may well include plural radio access points. Each radio access point may be, for example, a base station or a base station sector. Each user equipment terminal includes its own dedicated signaling channel in the downlink direction from the radio access point to the user equipment. There may also be uplink dedicated channels from the user equipment to the radio access point. In addition, four user equipment terminals  $UE_1 - UE_4$  share a common downlink signaling channel as well as a common downlink data channel. When there is signaling information to be or being transmitted on the shared signaling channel relevant to a specific user equipment terminal, the radio access point notifies that user equipment terminal using its downlink dedicated signaling channel. After receiving that positive notification, the user equipment detects and decodes the downlink shared signaling channel signaling information which is then used by the user equipment terminal to detect and decode data on the downlink shared data channel.

The functions of the radio access point may be performed by a radio base station, such as the radio base station 10 shown in Fig. 4. The radio base station includes a supervisory controller 12 that controls and/or coordinates signal processing and radio transceiving circuitry 14, transmit power controller 16 for controlling the transmit power of the transmitter portions of the radio transceiving circuitry, and transmission queues 18 for storing data packets to be transmitted to or received from various user equipment terminals. In addition, the supervisory controller 12 controls and/or coordinates the functions of a dedicated signaling controller 20, a shared signaling controller 22, and a shared data controller 24. The dedicated signaling controller 20 establishes dedicated signaling communications with each user equipment terminal via dedicated physical radio channels. In one example embodiment, the dedicated signaling controller 20 indicates that relevant information will be or is being transmitted over the shared signaling channel by setting a single bit to a certain value, e.g., "1" or "+1", on the user equipment terminal's dedicated signaling channel. Otherwise, the bit is set to another value, e.g., "0" or "-1."

Another type of technique that may be employed is to only transmit a signal over the dedicated signaling channel when there is relevant information for the user equipment channel to read on the shared signaling channel. Otherwise, nothing is transmitted on the downlink dedicated channel. This latter example embodiment is preferred because it  
5 minimizes the interference generated by the dedicated signaling. Usually only one user equipment terminal needs to read the downlink shared signaling channel during a certain time interval, and thus, the indicator only needs to be "on" for one downlink dedicated signaling channel during a corresponding time interval. The preferred approach also minimizes the interference generated by the dedicated signaling channels which increases  
10 overall system capacity.

The shared signaling controller 22 sends out substantive signaling information pertaining to obtaining information from one or more data channels shared by the multiple user equipment terminals  $UE_1 - UE_4$ . Example signaling information that may be transmitted by the shared signaling controller 22 over the downlink shared signaling  
15 channel includes, but is not limited to, (1) information identifying which user equipment terminal's data will be transmitted on the shared data channel during a particular time interval, (i.e., time multiplexed information), (2) a particular subset of shared data channel spreading codes to be used for data transmission to a specific user equipment terminal over the downlink shared data channel during a particular time interval, (i.e., code  
20 multiplexing), (3) information identifying a particular coding and/or modulation scheme used for data transmission on the downlink shared data channel to a specific user equipment terminal during each corresponding time interval (in the case of fast link adaptation), and (4) sequence numbering for data packets to be transmitted to a specific user equipment terminal on the downlink shared data channel during corresponding time  
25 intervals. The shared data controller 24 is responsible for transmitting data packets during specific time intervals in accordance with the corresponding signaling information relevant to that current time interval.

Fig. 5 shows in function block format an example user equipment terminal 30. A supervisory controller 32 supervises the operation of signal processing and

radio transceiving circuitry 34, transmit power control node 36, dedicated signaling controller 38, shared signaling controller 40, and shared data controller 42. These blocks in the user equipment 30 have functions similar to those in the radio base station 10 except that the dedicated signaling controller 38, the shared signaling controller 40, and the shared data controller 42 receive, detect, and/or decode the downlink transmissions transmitted from the dedicated signaling controller 20, the shared signaling controller 22, and the shared data controller 24, respectively, at the base station 10. Once the dedicated signaling controller 38 detects a positive indication on the downlink dedicated signaling channel, the shared signaling controller 40 coordinates with the supervisory controller 32 to have the signaling processing and radio transceiving circuitry 34 detect and decode the shared signaling channel information transmitted by the shared signaling controller 22. Using the signaling information thus obtained, the shared data controller 42 coordinates with the supervisory controller 32 to control the signal processing and radio transceiving circuitry 34 to detect and decode data packets on the downlink shared data channel during the appropriate time interval using the appropriate code if time and code multiplexing are used.

Procedures performed by a base station 10 implementing a non-limiting, example embodiment of the present invention is now described in conjunction with the flowchart shown in Fig. 6. The base station 10 establishes a corresponding downlink dedicated signaling channel between the base station and each of multiple user equipment terminals (block 50). A downlink shared signaling channel is established for transmitting signaling information such as transmission parameters pertaining to a downlink shared data traffic channel that can be accessed by multiple user equipment terminals (block 52). A downlink shared data traffic channel is established to convey data packets to the multiple user equipment terminals in accordance with transmission parameters and perhaps other types of signaling information transmitted over the downlink shared signaling channel (block 54). When there is signaling information to be or currently being transmitted on the downlink shared signaling channel relevant to a specific user equipment terminal, the base station notifies that user equipment terminal using that user equipment

terminal's corresponding downlink dedicated signaling channel (block 56), e.g., setting a flag or simply transmitting some type of powered "on" signal.

Procedures that may be followed by a user equipment terminal in implementing an example embodiment of the present invention are now described in conjunction with the flowchart shown in Fig. 7. The user equipment periodically (to save battery power) or continuously (e.g., once per time slot) monitors the status of a user-specific signaling indicator that may be transmitted over a signaling channel dedicated to that user equipment terminal (block 60). If a positive signaling indicator is not detected (block 62), the user equipment terminal may wait a predetermined time period (block 64), e.g., until the next corresponding time slot, before detecting the status of the user-specific signaling indicator on its dedicated signaling channel again. However, if a positive indicator is detected by the user equipment, the user equipment then detects and decodes the shared signaling channel to acquire relevant signaling information about the downlink shared data channel (block 66). Again, this signaling information may include the modulation and/or coding scheme of the data traffic channel, the sequence numbers of packets transmitted on that data channel, and other control information. Having acquired the relevant signaling information, the user equipment is able to properly detect and decode data packets on the downlink shared data channel using the appropriate signaling information received on the shared signaling channel (block 68).

Using the present invention, the downlink dedicated signaling channel transmits only minimal notification information, (e.g., one bit of information), to individual user equipment terminals which only requires minimal capacity and resources. In this way, the amount of signaling information that must be regularly transmitted to and received/processed by each of multiple user terminals is dramatically reduced. The resulting decreased bandwidth needs and interference increases the overall system capacity. User terminal power and data processing resources are conserved. The reduced capacity required by the simple positive notification employed by the downlink dedicated signaling channels further eliminates the need to reduce the spreading factor in order to

accommodate a larger number of signaling information bits. This means that the total number of channelization codes corresponding to the spreading factor may be maximized.

One example, non-limiting embodiment in which the present invention may be employed is in the context of a Universal Mobile Telecommunications System (UMTS) 100 shown in Fig. 8. A representative, circuit-switched core network shown as cloud 112, may be for example the Public-Switched Telephone Network (PSTN) or the Integrated Services Digital Network (ISDN). A representative, packet-switched core network, shown as a cloud 114, may be for example an IP network like the Internet. Both core networks are coupled to corresponding core network service nodes 16. The PSTN/ISDN circuit-switched network 112 is connected to a circuit-switched service node shown as a Mobile Switching Center (MSC) 118 that provides circuit-switched services. The packet-switched network 114 is connected to a General Packet Radio Service (GPRS) node 120 tailored to provide packet-switched services.

Each of the core network service nodes 118 and 120 connect to a UMTS Terrestrial Radio Access Network (UTRAN) 124 that includes one or more radio network controllers (RNCs) 126. Each RNC is connected to a plurality of base stations (BS) 128 and to any other RNCs in the UTRAN 122. Radio communications between the base stations and user equipment terminals 130 are by way of a radio interface. Radio access is based on Wideband CDMA (W-CDMA) with individual radio channels distinguished using spreading codes. Wideband CDMA provides wide radio bandwidth for multi-media services including packet data applications that have high data rate/bandwidth requirements. One scenario in which high speed data may need to be transmitted downlink from the UTRAN over the radio interface to a user equipment terminal is when the user equipment terminal requests information from a computer attached to the Internet, e.g., a website.

Dedicated Physical Channels (DPCH), each corresponding to a dedicated spreading code, are established between the UTRAN 122 and each user equipment terminal. A read DCH flag (RDF) transmitted over a DPCH informs a user equipment

terminal when it should read a Control-Downlink Shared Channel (C-DSCH). Also shown is a Downlink Shared Channel (DSCH) used for shared downlink packet transmission to the UE terminals. The RDF signaling over the downlink DPCH may use in one example embodiment antipodal  $\pm 1$  signaling, where a +1 indicates that user  
5 equipment terminal should read the signaling information on the C-DSCH, and a -1 indicates that the user equipment terminal need not read the C-DSCH (or vice versa). Alternatively, the RDF could employ power on/off signaling, where an RDF "ON" signal means that the user equipment should receive and decode information being transmitted on the C-DSCH, and no power signal on the DPCH indicates that the user equipment  
10 terminal need not receive and decode the C-DSCH. The latter power on/off RDF signaling is preferred because the RDF signal will normally be off for all user equipment terminals except the one user equipment terminal that is to read the C-DSCH in a certain time interval. This power on/off signaling thus minimizes power consumption by the UE and also minimizes the interference generated by the RDF signaling over the DPCHs,  
15 thereby increasing system capacity.

The RDF may be transmitted over the DPCH prior to the corresponding signaling information being transmitted on the C-DSCH, as shown in Fig. 9A. Alternatively, the RDF may be transmitted over the DPCH simultaneously or substantially simultaneously with the corresponding signaling information being transmitted on the  
20 C-DSCH, as shown in Fig. 9B. The example shown in Fig. 9A is preferred because the user equipment terminal does not have to despread and then detect the information on the C-DSCH unless the user equipment terminal knows it will receive relevant data on the C-DSCH. As a result, processing and buffering requirements are reduced.

The signaling information on the C-DSCH may be transmitted  
25 simultaneously with the corresponding data on the DSCH, as shown in Fig. 9B. Alternatively, the C-DSCH may be transmitted prior to the corresponding data on the DSCH, as shown in Fig. 9C. The alternative shown in Fig. 9B is preferred because it has a lower delay time.

The DPCH transmit power may be (although not necessarily) controlled by a closed-loop power control loop. The power of the C-DSCH may either be constant or proportional to the current power of the DPCH of the user equipment terminal to which the signaling information on the C-DSCH is intended.

5           While the present invention has been described with respect to particular example embodiments, those skilled in the art will recognize that the present invention is not limited to those specific embodiments described and illustrated herein. Different formats, embodiments, adaptations besides those shown and described, as well as many modifications, variations and equivalent arrangements may also be used to implement the  
10 invention. For example, although the detailed description above focuses on a downlink application, the present invention may be used in uplink applications. Therefore, while the present invention is described in relation to preferred example embodiments, it is to be understood that this disclosure is only illustrative and exemplary of the present invention. Accordingly, it is intended that the invention be limited only by the scope of the claims  
15 appended hereto.

**WHAT IS CLAIMED IS:**

1. A method for use in a radio communications system (10) including a radio network (122) communicating with multiple user equipment terminals (130) over a radio interface, characterized by:

5 providing a dedicated signaling channel between the radio network and each of the multiple user equipment terminals;

providing a shared signaling channel between the radio network and the multiple user equipment terminals for transmitting signaling information accessible by the multiple user equipment terminals; and

0 notifying one of the user equipment terminals on its dedicated signaling channel of information on the shared signaling channel relevant to the one user equipment terminal.

2. The method in claim 1, further comprising:

providing a data traffic channel for communicating packet data between the radio network node and the one user equipment terminal.

5 3. The method in claim 2, wherein the data traffic channel is a shared data traffic channel.

4. The method in claim 2, wherein the signaling information on the shared signaling channel relevant to the one user equipment terminal includes one or more of the following relating to the data traffic channel: modulation information, error coding  
0 information, data packet sequence numbering information, spreading code information, and timing information.

5 5. The method in claim 1, wherein the one user equipment terminal monitors the dedicated signaling channel periodically for information relevant to the one user equipment terminal, and in between periods of monitoring the dedicated signaling channel, the one user equipment terminal does not use shared signaling channel resources.



6. The method in claim 1, wherein the notification on the dedicated signaling channel is a flag.

7. The method in claim 1, wherein the notification on the dedicated signaling channel is transmitted a predetermined time interval before the signaling information on the shared signaling channel is transmitted.

8. The method in claim 1, wherein the notification on the dedicated signaling channel is transmitted at or about the same time as the signaling information on the shared signaling channel is transmitted.

9. The method in claim 2, wherein the notification on the dedicated signaling channel is transmitted a predetermined time interval before the signaling information on the shared signaling channel is transmitted, and wherein the packet data on the data traffic channel is transmitted at or about the same time as the signaling information on the shared signaling channel is transmitted.

10. The method in claim 2, wherein the notification on the dedicated signaling channel is transmitted at or about the same time as the signaling information on the shared signaling channel is transmitted, and wherein the packet data on the data traffic channel is transmitted at or about the same time as the signaling information on the shared signaling channel is transmitted.

11. The method in claim 2, wherein the notification on the dedicated signaling channel is transmitted a predetermined time interval before the signaling information on the shared signaling channel is transmitted, and wherein the packet data on the traffic channel is transmitted some time after the signaling information on the shared signaling channel is transmitted.

12. The method in claim 2, wherein the notification on the dedicated signaling channel is transmitted at or about the same time as the signaling information on the shared signaling channel is transmitted, and wherein the packet data on the traffic channel is

transmitted some time after the signaling information on the shared signaling channel is transmitted.

13. The method in claim 1, wherein the notification to the user equipment terminal on the dedicated signaling channel includes an on/off signaling technique such that when the radio network transmits a signal on the dedicated signaling channel, the user equipment accesses information from the shared signaling channel, and when there is no signal transmitted from the radio network on the dedicated signaling channel, the user equipment does not access information from the shared signaling channel.

14. The method in claim 1, wherein the notification to the active user equipment terminal on the dedicated signaling channel includes a flag such that if the flag is set, the user equipment accesses information from the shared signaling channel, and if the flag is not set, the user equipment does not access information from the shared signaling channel.

15. In a radio communications system (10) where a radio network node (128) communicates with multiple user equipment terminals (130) over a radio interface, the radio network node characterized by being configured to establish a dedicated signaling channel between the radio network node and each of the multiple user equipment terminals, to establish a shared signaling channel between the radio network node and the multiple user equipment terminals for transmitting signaling information accessible by the multiple user equipment terminals, and to notify one of the multiple user equipment terminals on its dedicated signaling channel of information on the shared signaling channel relevant to the one user equipment terminal.

16. The radio network node in claim 15 configured to establish a data traffic channel for communicating packet data between the radio network node and the one user equipment terminal.

17. The radio network node in claim 16, wherein the data traffic channel is a shared data traffic channel.

18. The radio network node in claim 16, wherein the information on the shared signaling channel relevant to the one user equipment terminal includes one or more of the following relating to the data traffic channel: modulation information, error coding information, data packet sequence numbering information, spreading code information,  
5 and timing information.

19. The radio network node in claim 15, wherein the radio network node is configured to notify the one user equipment terminal using a flag.

20. The radio network node in claim 15, wherein the radio network node is configured to notify the one user equipment terminal on its dedicated signaling channel a  
10 predetermined time interval before the signaling information on the shared signaling channel is transmitted.

21. The radio network node in claim 15, wherein radio network node is configured to notify the one user equipment terminal on its dedicated signaling channel at or about the same time as radio network node transmits the signaling information on the  
15 shared signaling channel.

22. The radio network node in claim 16, wherein the radio network node is configured to notify the one user equipment terminal on its dedicated signaling channel a predetermined time interval before the radio network node transmits the signaling information on the shared signaling channel, and wherein the radio network node is  
20 configured to transmit the packet data on the data traffic channel at or about the same time as the radio network node transmits the signaling information on the shared signaling channel.

23. The radio network node in claim 16, wherein the radio network node is configured to notify the one user equipment terminal on its dedicated signaling channel at or about the same time as the radio network node transmits the signaling information on  
25 the shared signaling channel, and wherein the radio network node is configured to transmit

the packet data on the data traffic channel at or about the same time as the radio network node transmits the signaling information on the shared signaling channel.

24. The radio network node in claim 16, wherein the radio network node is configured to notify the one user equipment terminal on its dedicated signaling channel a  
5 predetermined time interval before the radio network node transmits the signaling information on the shared signaling channel, and wherein the radio network node is configured to transmit the packet data on the traffic channel some time after the radio network node transmits the signaling information on the shared signaling channel.

25. The radio network node in claim 16, wherein the radio network node is  
10 configured to notify the one user equipment terminal on its dedicated signaling channel at or about the same time as the radio network node transmits the signaling information on the shared signaling channel is transmitted, and wherein the radio network node transmits the packet data on the traffic channel some time after the radio network node transmits the signaling information on the shared signaling channel.

15 26. The radio network node in claim 15, wherein the radio network node is configured to transmit the notification to the user equipment terminal on the dedicated signaling channel using an on/off signaling technique such that when the radio network node transmits a signal on the dedicated signaling channel, the user equipment should access information from the shared signaling channel, and when there is no signal  
20 transmitted from the radio network node on the dedicated signaling channel, the user equipment should not access information from the shared signaling channel.

27. The radio network node in claim 15, wherein the radio network node is configured to transmit the notification to the user equipment terminal on the dedicated signaling channel using a flag such that if the flag is set, the user equipment should access  
25 information from the shared signaling channel, and if the flag is not set, the user equipment should not access information from the shared signaling channel.

28. In a radio communications system (10) including a radio network node (128) communicating with multiple user equipment terminals (130) over a radio interface, a user equipment terminal characterized by being configured to monitor a status of a notification on a dedicated signaling channel between the radio network node and the user equipment terminal of information on a shared signaling channel relevant to the user equipment terminal, and if the notification is positive, to receive the relevant information on the shared signal channel.

29. The user equipment terminal in claim 28, wherein the information on the shared signal channel relates to a data traffic channel for communicating packet data between the radio network node and the user equipment terminal.

30. The user equipment terminal in claim 29, wherein the data traffic channel is a shared data traffic channel.

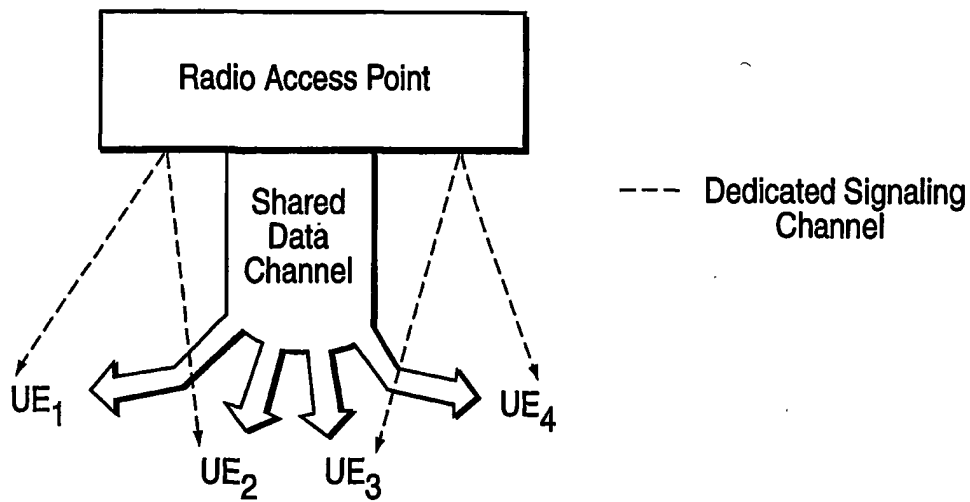
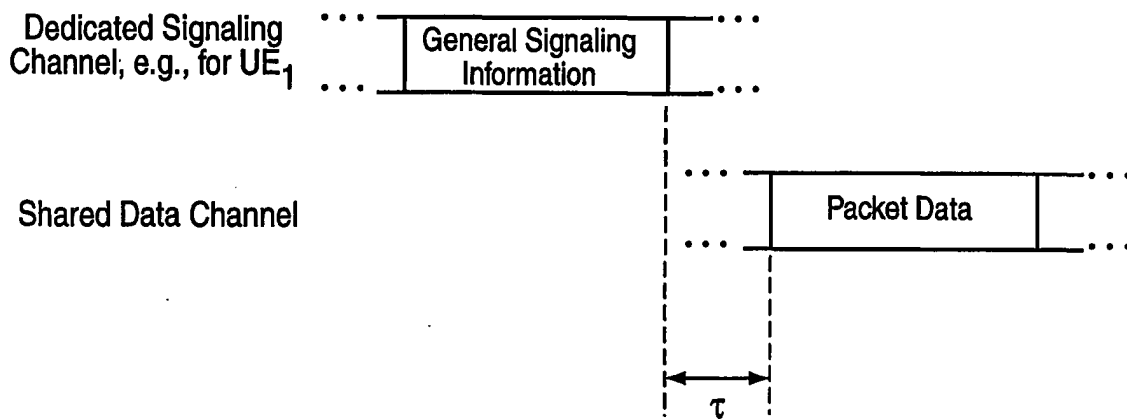
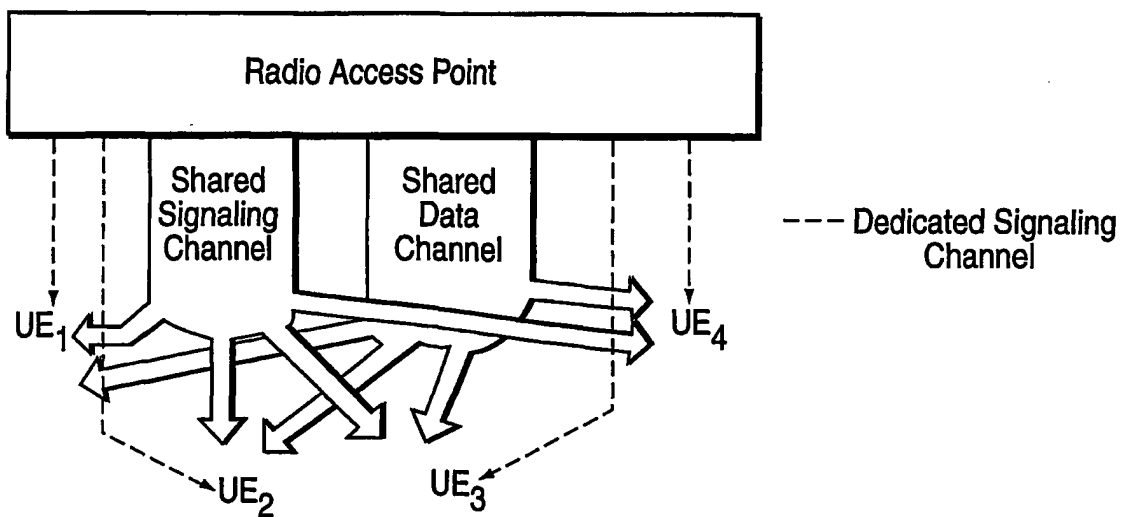
31. The user equipment terminal in claim 29, wherein the signaling information on the shared signaling channel relevant to the user equipment terminal includes one or more of the following relating to the data traffic channel: modulation information, error coding information, data packet sequence numbering information, spreading code information, and timing information.

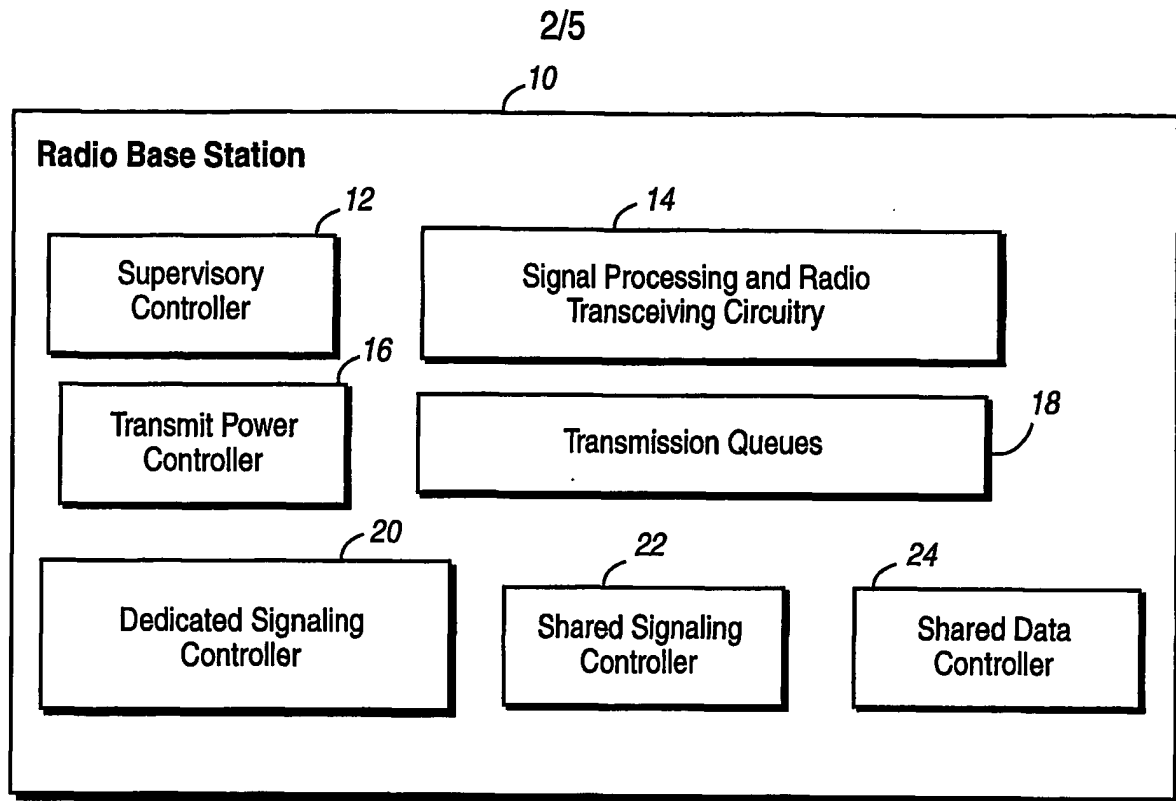
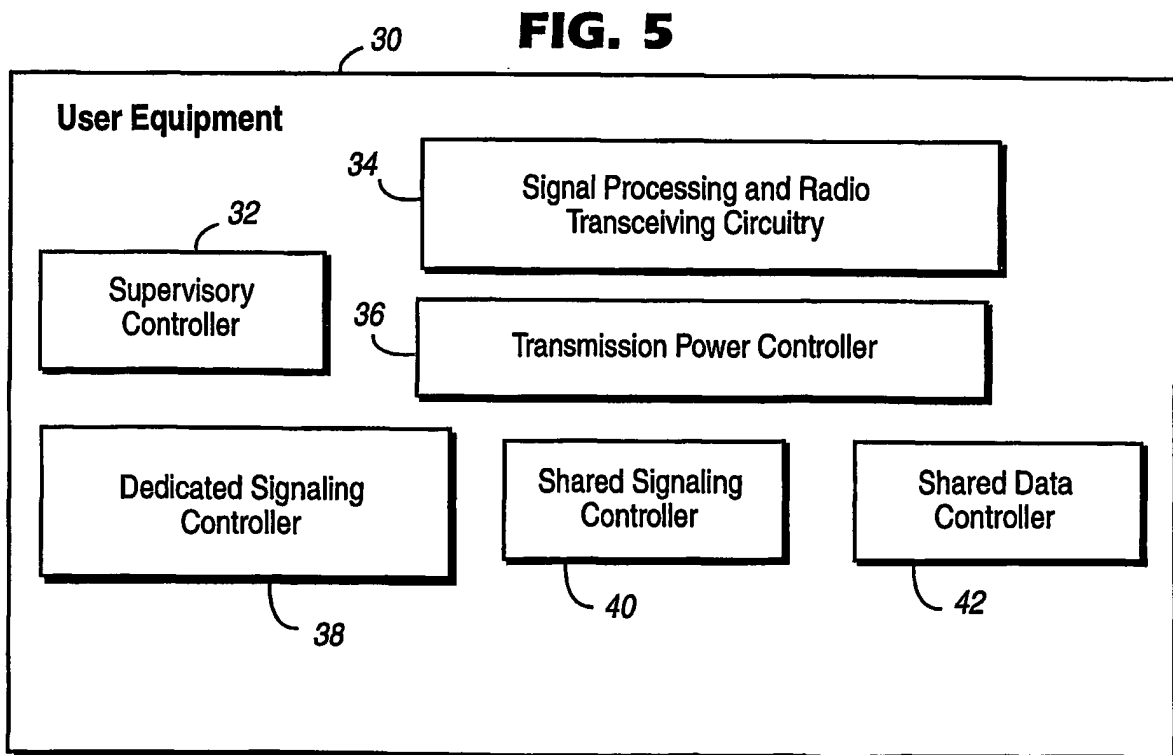
32. The user equipment terminal in claim 28, wherein the user equipment terminal is further configured to monitor the dedicated signaling channel periodically for information relevant to the one user equipment terminal, and in between periods of monitoring the dedicated signaling channel, the one user equipment terminal is configured to conserve resources with respect to the shared signaling channel.

33. The user equipment terminal in claim 28, wherein the notification is a flag.

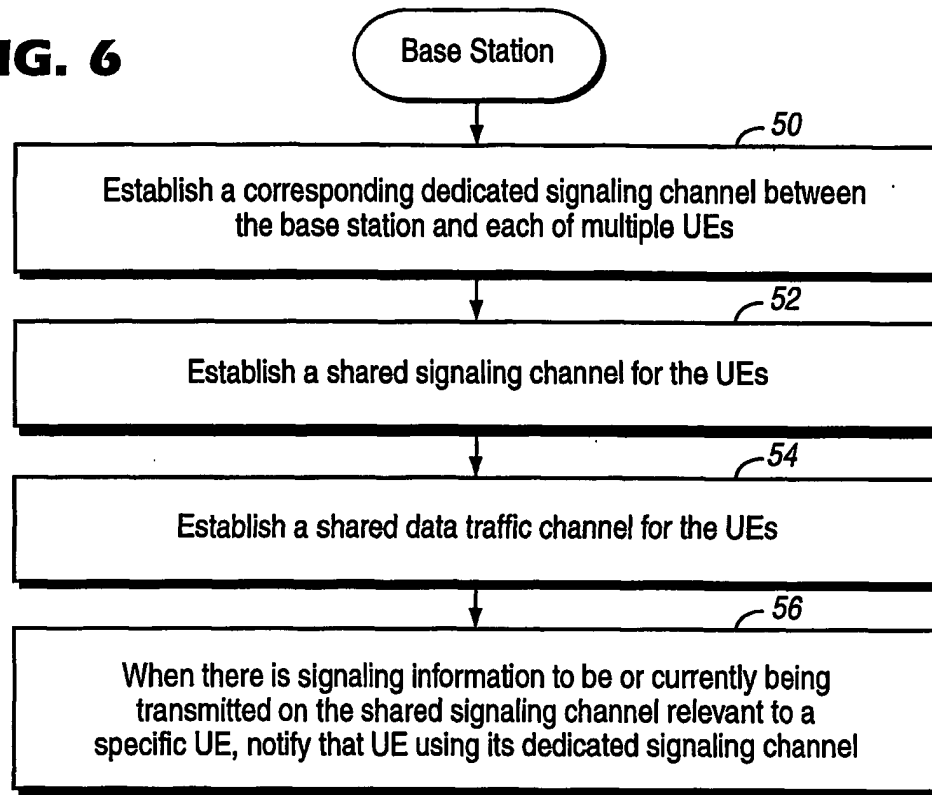
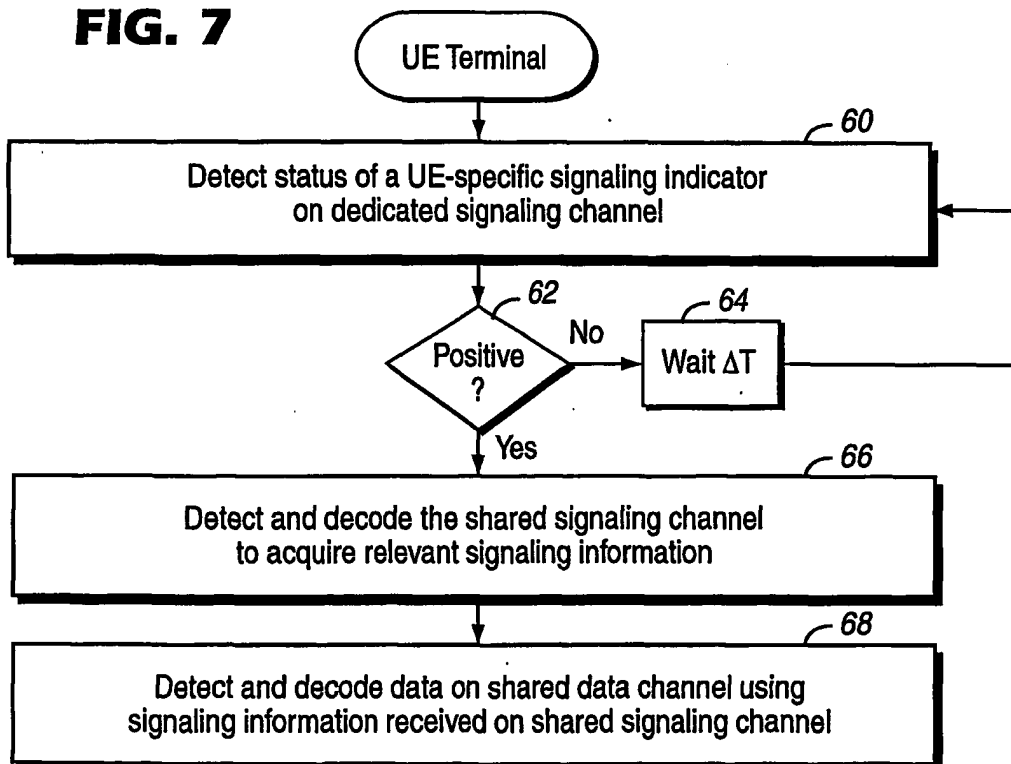
**FIG. 1**

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**FIG. 2****FIG. 3**

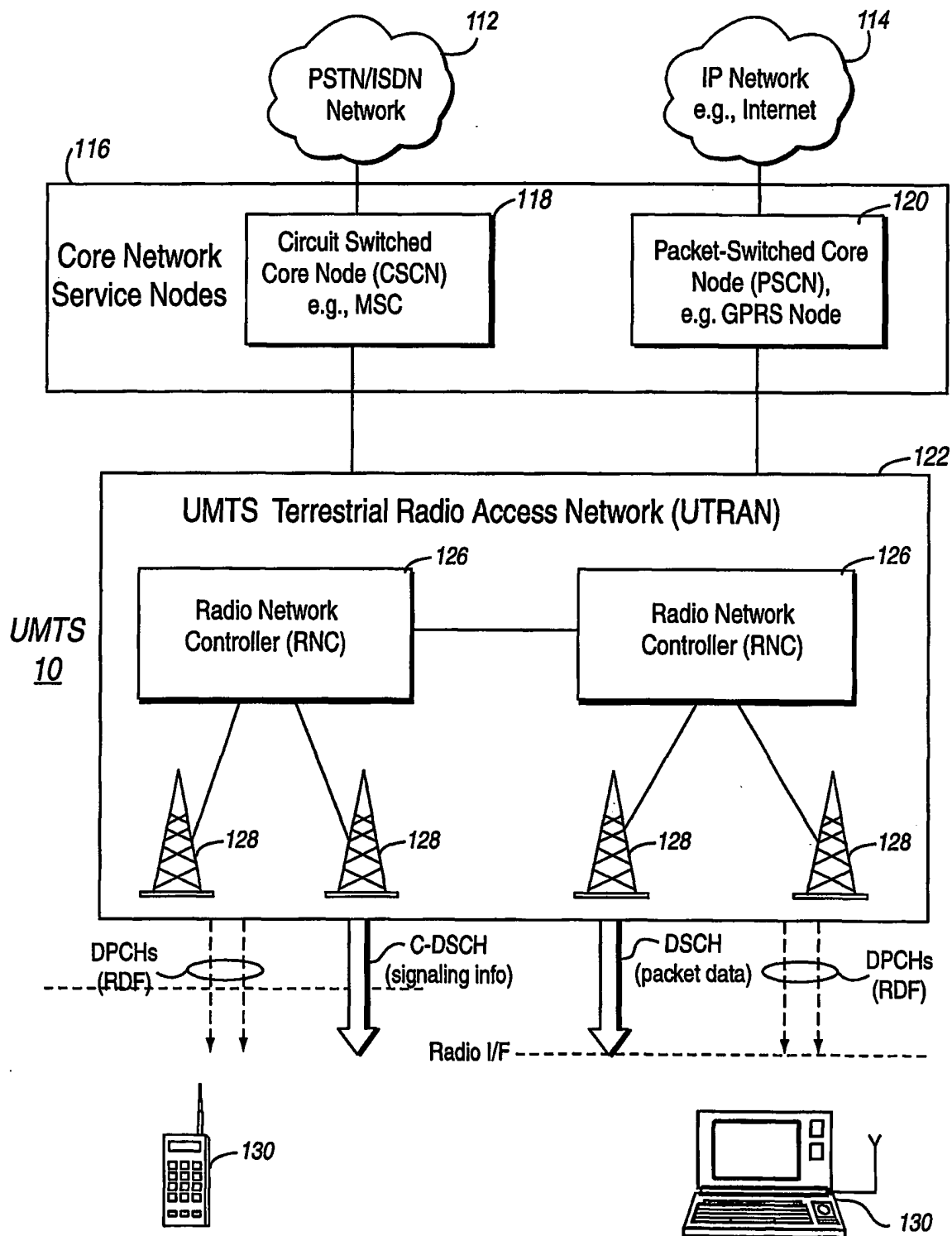
**FIG. 4**

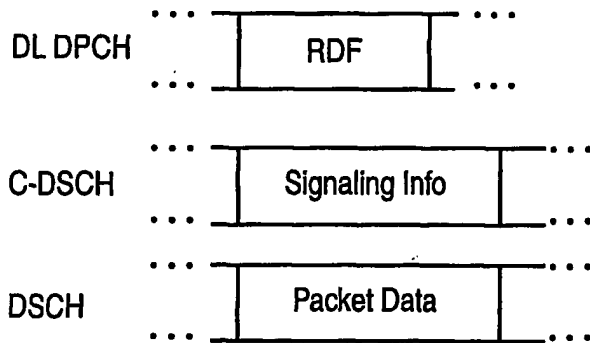
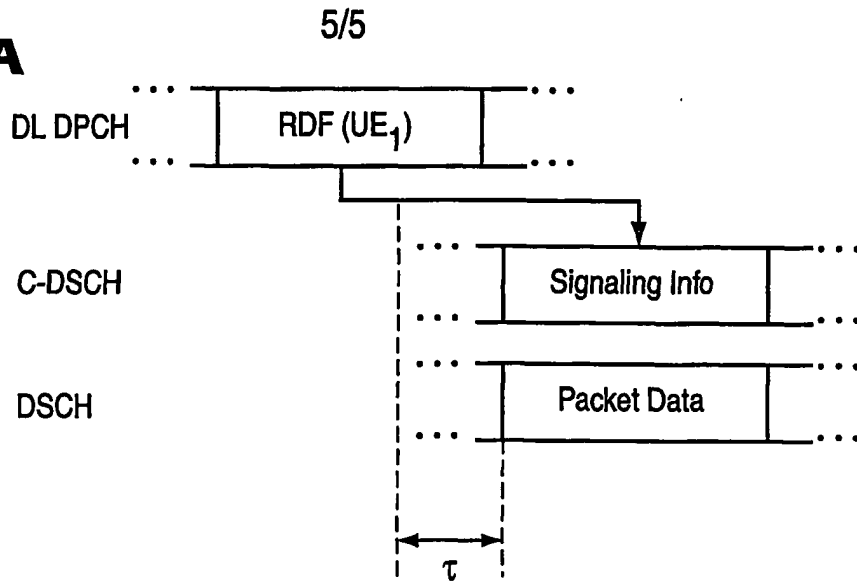
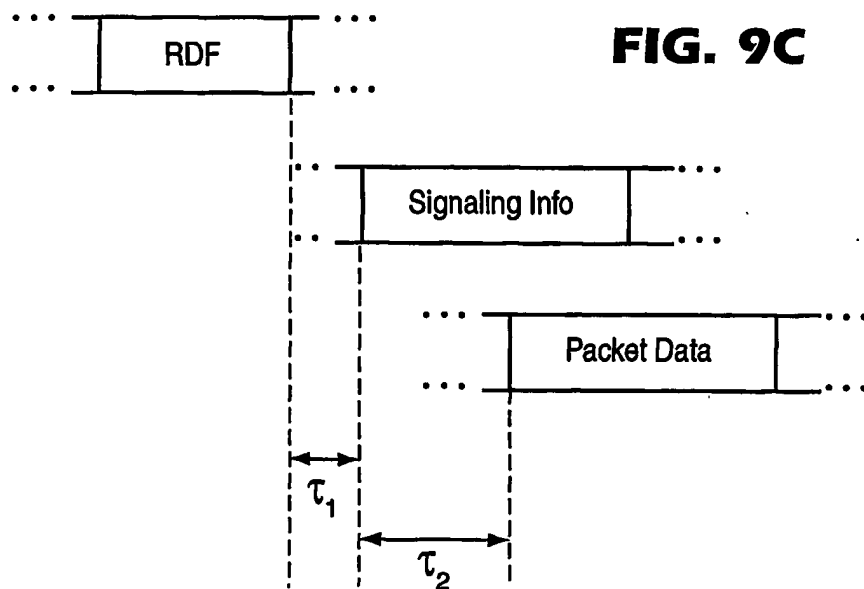
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**FIG. 6****FIG. 7**



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**FIG. 8**

**FIG. 9A****FIG. 9B****FIG. 9C**